

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : **07-295391**

(43)Date of publication of application : **10.11.1995**

(51)Int.Cl.

G03G 15/16  
B65H 5/02

(21)Application number : **06-081820**

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(22)Date of filing : **20.04.1994**

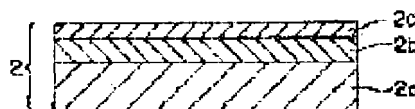
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## (54) TRANSFER BELT

### (57)Abstract:

**PURPOSE:** To obtain good traveling property and separating property of paper sheets and to stably obtain good images by forming a transfer belt into a three-layer structure including a dielectric layer and a surface layer comprising a material having lower specific resistivity than that of the dielectric layer.

**CONSTITUTION:** This transfer belt 2 has a function to transfer a toner image on a image holding body to a paper sheet or to carry the paper sheet, or has both functions. The belt 2 has a three-layer structure consisting of an inner layer 2a comprising a chloroprene which is a rubber material having medium electric resistance, dielectric layer 2b comprising urethane resin on the inner layer 2a, and surface layer 2c on the dielectric layer 2b. The surface layer 2c is formed by spray-coating the surface of the dielectric layer with a solvent-base coating material of carbon-dispersed silicone having a lower specific resistivity than that of the dielectric layer 2b. Since the surface material which relates to discharge is changed, discharging due to peeling of a sheet when the sheet is separated is suppressed. The surface layer 2c is made thin so that electrification property of the transfer belt 2 is not largely changed even though the resistance of the surface layer 2c is lower than the dielectric layer 2b. Thus, good traveling property of paper sheets is maintained.



## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision]

of rejection]

[Date of requesting appeal against examiner's  
decision of rejection]

[Date of extinction of right]

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[JP,07-295391,A]

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**CLAIMS**

[Claim(s)]

[Claim 1] The imprint belt characterized by having made the rubber material of inside resistance into the inner layer, and considering as the three-tiered structure by which the rate of specific resistance formed the surface of the low quality of the material in the front face of the aforementioned dielectric layer rather than this dielectric layer in the imprint belt which is the composition which formed the dielectric layer in this inner layer, and has the imprint to the form of the toner picture on an image support, conveyance of a form, or the function of the both.

**DETAILED DESCRIPTION**

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention is used for the imprint sections, such as a copying machine, a printer, and facsimile, and relates the toner picture of an image support to the imprint belt for conveying an imprint or a form in a form.

[0002]

[Description of the Prior Art] Generally, the imprint belt used for imprint belt equipments, such as a copying machine, achieves an operation of separation of conveyance of a form, the imprint of the toner picture to a form, and an imprinted form, and many corona discharge methods are used as electrification to an imprint belt in conventional imprint belt equipment. However, recently, there is imprint belt equipment (Ricoh FT550) of a method directly impressed with a bias roller etc., and according to such a method, it becomes possible to reduce ozone generating to the

concentration of 1/10 to 1/20 of the conventional method. Moreover, in the imprint belt of this direct impression method, the dielectric layer for raising the conveyance nature and separability of a form as a surface of the inner layer which consists of the rubber material of inside resistance is needed.

[0003] As a conventional example of an imprint belt, the imprint belt 20 of two-layer structure as shown in drawing 4 is known. This set the chloroprene rubber of inside resistance to inner layer 2a, and in order of rubber milling, a knockout, vulcanization, and polish, through each process, this chloroprene rubber 2a was formed in thickness  $t=0.5$  (mm), carried out the spray application of the urethane resin on the front face, and has obtained dielectric layer 2b of a 20-micrometer film.

[0004]

[Problem(s) to be Solved by the Invention] In the above-mentioned conventional imprint belt, although a form is made to stick to an imprint belt and conveyance nature was raised by the electrostatic force, when a form and an imprint belt dissociated, ablation electric discharge took place, and there was a trouble that a toner picture was confused. This ablation electric discharge was lessened, and in order to prevent disorder of a picture, when the low imprint belt of electrification nature was used, there was a trouble that conveyance nature fell shortly. Then, the purpose of this invention cancels the conventional trouble mentioned above, and the conveyance nature of a form and its separability are good, and it is to offer the imprint belt which is stabilized and can acquire a good picture.

[0005]

[Means for Solving the Problem] The summary of this invention is to have made the rubber material of inside resistance into the inner layer, and have considered as the three-tiered structure by which the rate of specific resistance formed the surface of the low quality of the material in the front face of the aforementioned dielectric layer rather than this dielectric layer in the imprint belt which is the composition which formed the dielectric layer in this inner layer, and has the imprint to the form of the toner picture on an image support, conveyance of a form, or the function of the both.

[0006]

[Function] By forming a surface in the dielectric layer of an imprint belt, about the ablation electric discharge at the time of a form dissociating, the quality of the material of the front face in connection with electric discharge changes, and, according to this invention, electric discharge is suppressed. And since the thickness of the surface is thin, even if surface resistance is smaller than resistance of the aforementioned dielectric layer, there is no big change in the electrification nature of

an imprint belt, and the good conveyance nature of a form is also maintained.

[0007]

[Example] Hereafter, the example of this invention is explained with reference to a drawing. An example of the image formation equipment which adopted the imprint belt of this invention as drawing 1 is shown. In this drawing, the imprint belt 2 is arranged for the resist roller 16 in contact with the photo conductor drum 1 ahead of the photo conductor drum 1 again, respectively. The imprint belt 2 is laid between the drive roller 3 and the follower roller 4. This imprint belt 2 has a three-tiered structure of surface 2c (surface electrical resistance 105~106ohm) to which the rate of specific resistance carried out the spray application of the solvent paint of the carbon distribution silicone system of the low quality of the material from the dielectric layer on the front face of inner layer 2a which consists of the chloroprene rubber of the rubber material whose electric resistance is inside resistance, dielectric layer 2b (1012ohms of surface electrical resistance) which consists of the urethane resin formed on this inner layer 2a, and this dielectric layer 2b, as shown in drawing 2 .

[0008] The drive roller 3 loops the periphery side of a metal roller around the rubber layer for raising coefficient of friction with the imprint belt 2, and is formed in it, and the follower roller 4 consists of the metal roller. From the nip section 13 of the photo conductor drum 1 and the imprint belt 2 of the inner skin of the imprint belt 2, the bias roller 5 for voltage impression contacts the position which only predetermined distance left, and it is arranged to the direction of the drive roller 3, and between this bias roller 5 and the drive roller 3, after the contact bowl 6 has contacted the inner skin of the imprint belt 2, it is arranged. The bias roller 5 is a metal roller, and is followed and rotated to rotation of the imprint belt 2, and a contact bowl 6 consists of a metal plate, and as shown in drawing 3 , the contact bowl 6 is connected to the power supply 7 for the bias roller 5 through the transcriptional-control board 18 at the power supply 7.

[0009] The fixing equipment 15 which consists of the fixing roller 13 and the pressurization roller 14 is arranged in the position which only predetermined distance separated from the back end section of the imprint belt 2. The imprint belt 2 of this example is setting the chloroprene rubber of inside resistance to inner layer 2a. this chloroprene rubber 2a It is formed in thickness  $t = 0.5$  (mm) through each process in order of rubber milling, a knockout, vulcanization, and polish. The spray application of the urethane resin was carried out on the front face , dielectric layer 2b of a 20-micrometer film has been obtained, and it has a three-tiered structure which applied the carbon distribution silicone system solvent paint to the front face of

dielectric layer 2b of a urethane resin, and formed 5-micrometer surface 2c in it further. The paint condition is coated object rotational frequency:80rpm, spray gun traverse-speed:9 mm/sec, spray gun:ARS-05 (diameter \*\*of nozzle 0.5), amount of discharge flows:9 ml/min of coating liquid, atomization flow rate:3 l/min, a coated object, and spray gun distance:50mm, and was dried for 40 minutes at 160 degrees C in the hot-air-drying furnace after paint. In addition, not only chloroprene rubber but thermoplastic elastomer is sufficient as the rubber material (inner layer 2a) of inside resistance.

[0010] moreover, the thing which a urethane resin (dielectric layer 2b) becomes from the tradename C-230u base-resin (product made from Hirono Chemistry) 100 weight section, and the tradename C-230u curing agent (product made from Hirono Chemistry) 30 weight section -- moreover, the electro pack Z-307 (the product made from size \*\*\*\*\*, 106ohms of surface electrical resistance) was used for the aforementioned silicone system solvent paint, respectively In the above-mentioned composition, the form 8 conveyed with the resist roller 16 is first put on the imprint belt 2. By impressing voltage through the bias roller 5 from a power supply 7, current flows to a photo conductor drum 1 and contact-bowl 6 side.

[0011] Here, if the feedback current which flows the force current outputted from a power supply 7 from a contact bowl 6 to a ground side through I1 and the imprint belt 2 is set to I2 as shown in drawing 3, this feedback current I2 will be detected, the voltage of a power supply 7 will be changed so that  $I1-I2=I_{out}$  may become fixed, and the value of force current I1 will be controlled. It is referred to as  $I_{out}=40\mu A$  in this example. The toner picture on the photo conductor drum 1 is imprinted by this method by the form 8, and the imprint belt 2 top is conveyed. Next, the curvature of the drive roller 3, a form 8 peels from the imprint belt 2, and a toner fixes it with the fixing roller 13 and the pressurization roller 14. In Ricoh FT5500 (what newly attached the imprint belt 2) which performs such operation, when picture evaluation was performed, the good picture was acquired.

[0012] Next, as other examples of the imprint belt of a three-tiered structure, the spray application of the S-2780 (the Nissan Chemical Industries, Ltd. make, 105ohms of surface electrical resistance) which is the solvent paint of stainless steel fiber distribution acrylic resin was carried out on the same paint conditions as the above-mentioned example, the 5-micrometer film (surface) was formed in the front face of dielectric layer 2b of the imprint belt 20 of the above-mentioned two-layer structure, and the imprint belt was manufactured. The good picture was acquired, when this imprint belt was attached in aforementioned Ricoh FT5500 like the imprint

belt 2 and picture evaluation was performed. Since the thickness is thin when surface electrical resistance forms in the front face of dielectric layer 2b surface 2c which is the thin film which are 105–106ohm like each imprint belt of this three-tiered structure, even if resistance of surface 2c is smaller than resistance of dielectric layer 2b, it is thought that there is no big change in the electrification nature of an imprint belt. Moreover, the method of electric discharge changes and ablation electric discharge is considered whether it became the method of the electric discharge which hardly affects the transfer picture (toner) of a form 8, when the quality of the material of the front face in connection with electric discharge changes.

[0013] In addition, these examples can be used also for the equipment configuration which uses corona discharge for the imprint belt equipment, for example, electrification, and electric discharge of the direct impression method shown in drawing 1 and drawing 2 . Moreover, it is applicable not only to the imprint belt having the function of an imprint and conveyance but the imprint belt which has the function of only an imprint or conveyance.

[0014]

[Effect of the Invention] Since the imprint belt was made into the three-tiered structure by which the rate of specific resistance formed the surface of the low quality of the material in the front face of the dielectric layer rather than it according to this invention as explained above, while being able to obtain the good conveyance nature of a form, and separability, it is stabilized and a good picture can be acquired. Especially, in a halftone picture, the picture which was excellent as compared with the conventional imprint belt can be acquired.

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram showing an example of the image formation equipment which adopted the imprint belt of this invention.

[Drawing 2] It is the cross section of the imprint belt in which the example of this invention is shown.

[Drawing 3] It is the enlarged view showing the imprint section of imprint belt equipment.

[Drawing 4] It is the cross section showing the two-layer structure of the conventional imprint belt.

**[Description of Notations]**

**1 Image Support**

**2 Imprint Belt**

**2a Inner layer**

**2b Dielectric layer**

**2c Surface**

**8 Form**





(19)日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11)特許出願公開番号

特開平7-295391

(43)公開日 平成7年(1995)11月10日

(51)Int.Cl.<sup>6</sup>

識別記号

庁内整理番号

F I

技術表示箇所

G 0 3 G 15/16

B 6 5 H 5/02

A

審査請求 未請求 請求項の数1 O L (全 4 頁)

(21)出願番号 特願平6-81820

(22)出願日 平成6年(1994)4月20日

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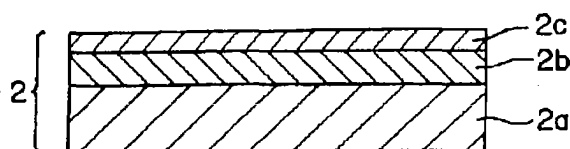
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(54)【発明の名称】 転写ベルト

(57)【要約】

【目的】 用紙の搬送性、及び分離性が良く、安定して良好な画像を得ることができる転写ベルトを提供すること。

【構成】 中抵抗のゴム材を内層(2a)とし、この内層(2a)に誘電層(2b)を形成した構成で、像担持体(1)上のトナー画像の用紙(8)への転写、又は用紙(8)の搬送、あるいはその両方の機能を有する転写ベルト(2)であって、前記誘電層(2b)の表面に、この誘電層(2b)よりも固有抵抗率が低い材質の表層(2c)を形成した3層構造になっている。



## 【特許請求の範囲】

【請求項1】中抵抗のゴム材を内層とし、この内層に誘電層を形成した構成であって、像担持体上のトナー画像の用紙への転写、又は用紙の搬送、あるいはその両方の機能を有する転写ベルトにおいて、前記誘電層の表面に、この誘電層よりも固有抵抗率が低い材質の表層を形成した3層構造としたことを特徴とする転写ベルト。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】この発明は、複写機、プリンター、ファクシミリ等の転写部に用いられ、像担持体のトナー画像を用紙に転写、あるいは用紙を搬送するための転写ベルトに関するものである。

## 【0002】

【従来の技術】一般に、複写機等の転写ベルト装置に使用される転写ベルトは、用紙の搬送、用紙へのトナー画像の転写、及び転写済み用紙の分離の作用を果たすものであり、従来の転写ベルト装置においては、転写ベルトへの帯電としてコロナ放電方式が多く用いられている。しかし、最近ではバイアスローラ等で直接印加する方式の転写ベルト装置（リコーFT550）があり、このような方式によれば、オゾン発生を従来の方式の1/10から1/20の濃度へ低減することが可能となる。また、この直接印加方式の転写ベルトにおいては、中抵抗のゴム材から成る内層の表層として用紙の搬送性や分離性を向上させるための誘電層が必要になる。

【0003】転写ベルトの従来例として、図4に示すような、2層構造の転写ベルト20が知られている。これは、中抵抗のクロロブレンゴムを内層2aとし、このクロロブレンゴム2aは、ゴム練り、押し出し、加硫、研磨の順に各工程を経て、厚み $t=0.5$ （mm）に形成され、その表面にウレタン樹脂をスプレー塗布し、 $20\mu\text{m}$ の膜の誘電層2bを得ている。

## 【0004】

【発明が解決しようとする課題】上記従来の転写ベルトにおいては、静電気力によって用紙を転写ベルトに吸着させて搬送性を向上させているが、用紙と転写ベルトが分離する際に剥離放電が起り、トナー画像が乱れるという問題点があった。この剥離放電を少なくし、画像の乱れを防ぐために帯電性の低い転写ベルトを用いると、今度は搬送性が低下するという問題点があった。そこで、この発明の目的は、上述した従来の問題点を解消して、用紙の搬送性、及び分離性が良く、安定して良好な画像を得ることができる転写ベルトを提供することにある。

## 【0005】

【課題を解決するための手段】この発明の要旨は、中抵抗のゴム材を内層とし、この内層に誘電層を形成した構成であって、像担持体上のトナー画像の用紙への転写、

又は用紙の搬送、あるいはその両方の機能を有する転写ベルトにおいて、前記誘電層の表面に、この誘電層よりも固有抵抗率が低い材質の表層を形成した3層構造としたことにある。

## 【0006】

【作用】本発明によれば、転写ベルトの誘電層に表層を形成することにより、用紙が分離する際の剥離放電に関しては、放電に関わる表面の材質が変わり、放電が抑えられる。しかも、その表層の膜厚は薄いため、表層の抵抗が前記誘電層の抵抗より小さくても転写ベルトの帯電性に大きな変化は無く、用紙の良好な搬送性も維持される。

## 【0007】

【実施例】以下、この発明の実施例を図面を参照して説明する。図1に、この発明の転写ベルトを採用した画像形成装置の一例を示す。同図において、感光体ドラム1の前方にレジストローラ16が、また、感光体ドラム1に当接して転写ベルト2がそれぞれ配置されている。転写ベルト2は、駆動ローラ3と従動ローラ4との間に張架されている。この転写ベルト2は、図2に示すように、電気抵抗が中抵抗であるゴム材のクロロブレンゴムから成る内層2aと、この内層2aの上に形成されたウレタン樹脂から成る誘電層2b（表面抵抗 $10^{12}\Omega$ ）と、この誘電層2bの表面に、誘電層よりも固有抵抗率が低い材質のカーボン分散シリコン系の溶剤塗料をスプレー塗布した表層2c（表面抵抗 $10^5\sim 10^6\Omega$ ）の3層構造になっている。

【0008】駆動ローラ3は、金属ローラの外周面に転写ベルト2との摩擦係数を高めるためのゴム層を巻装して形成され、従動ローラ4は、金属ローラから成っている。転写ベルト2の内周面の、感光体ドラム1と転写ベルト2とのニップ部13から駆動ローラ3の方へ所定距離だけ離れた位置には、電圧印加のためのバイアスローラ5が当接して配置され、また、このバイアスローラ5と駆動ローラ3との間には接触板6が転写ベルト2の内周面に当接した状態で配置されている。バイアスローラ5は、金属ローラであって、転写ベルト2の回転に従動して回転し、接触板6は金属板からなり、図3に示すように、バイアスローラ5は、電源7に、接触板6は転写制御板18を介して電源7に接続されている。

【0009】転写ベルト2の後端部から所定距離だけ離れた位置には、定着ローラ13と加圧ローラ14から成る定着装置15が配置されている。この実施例の転写ベルト2は、中抵抗のクロロブレンゴムを内層2aとしており、このクロロブレンゴム2aは、ゴム練り、押し出し、加硫、研磨の順に各工程を経て、厚み $t=0.5$ （mm）に形成され、その表面にウレタン樹脂をスプレー塗布し、 $20\mu\text{m}$ の膜の誘電層2bを得ており、さらに、ウレタン樹脂の誘電層2bの表面に、カーボン分散シリコン系溶剤塗料を塗布して $5\mu\text{m}$ の表層2cを形成し

た3層構造になっている。その塗装条件は、被塗物回転数：80rpm、スプレーガン移動速度：9mm/sec、スプレーガン：ARS-05（ノズル径φ0.5）、塗工液の吐出流量：9ml/min、霧化流量：3l/min、被塗物とスプレーガン距離：50mmであって、塗装後、熱風乾燥炉において160℃で40分間乾燥させた。なお、中抵抗のゴム材（内層2a）は、クロロブレンゴムに限らず、熱可塑性エラストマーでも良い。

【0010】また、ウレタン樹脂（誘電層2b）は、商品名C-230u主剤（広野化学（株）製）100重量部、商品名C-230u硬化剤（広野化学（株）製）30重量部からなるものを、又前記シリコン系溶剤塗料は、エレクトロパックZ-307（大泰化工（株）製、表面抵抗 $10^6\Omega$ ）をそれぞれ使用した。上記構成において、先ず、レジストローラ16で搬送された用紙8は、転写ベルト2上に乗せられる。電源7からバイアスローラ5を介して電圧を印加することにより、電流は感光体ドラム1及び接触板6側に流れる。

【0011】ここで、図3に示すように、電源7から出力される印加電流を $I_1$ 、転写ベルト2を介して接触板6よりアース側へ流れる帰還電流を $I_2$ とすると、この帰還電流 $I_2$ を検知し、 $I_1 - I_2 = I_{out}$ が一定になるように電源7の電圧を変化させ、印加電流 $I_1$ の値を制御している。この実施例では、 $I_{out} = 40\mu A$ としている。用紙8には、この方式で感光体ドラム1上のトナー画像が転写され、転写ベルト2上を搬送される。次に、駆動ローラ3の曲率によって用紙8は転写ベルト2からはがれ、定着ローラ13及び加圧ローラ14によりトナーは固着される。このような動作を行うリコーFT5500（転写ベルト2を新たに取付けたもの）において、画像評価を行ったところ、良好な画像が得られた。

【0012】次に、3層構造の転写ベルトの他の実施例として、上記2層構造の転写ベルト20の誘電層2bの表面に、ステンレス繊維分散アクリル樹脂の溶剤塗料であるS-2780（日産化学工業（株）製、表面抵抗 $10^6\Omega$ ）を、上記実施例と同様の塗装条件でスプレー塗布して5 $\mu m$ の膜（表層）を形成し、転写ベルトを製作した。この転写ベルトを転写ベルト2と同様に、前記リコーFT5500に取り付けて、画像評価を行ったところ、

良好な画像が得られた。この3層構造の各転写ベルトのように、誘電層2bの表面に表面抵抗が $10^5 \sim 10^6\Omega$ の薄い膜である表層2cを形成した場合、その膜厚は薄いので、表層2cの抵抗が誘電層2bの抵抗より小さくても転写ベルトの帯電性に大きな変化は無いと考えられる。また、剥離放電に関しては、放電に関わる表面の材質が変わることによって放電の仕方が変わり、用紙8の転写画像（トナー）にほとんど影響を与えない放電の仕方になったのではないかと考えられる。

【0013】なお、これらの実施例は、図1及び図2に示す、直接印加方式の転写ベルト装置だけに限らず、例えば帯電や除電にコロナ放電を用いる装置構成にも用いることができる。また、転写及び搬送の機能を併せ持つ転写ベルトだけでなく、転写又は搬送のみの機能を有する転写ベルトにも適用することができる。

【0014】

【発明の効果】以上説明したように、この発明によれば、転写ベルトを、その誘電層の表面に、それよりも固有抵抗率が低い材質の表層を形成した3層構造としたので、用紙の良好な搬送性、及び分離性を得ることができると共に、安定して良好な画像を得ることができる。特に、ハーフトーン画像においては、従来の転写ベルトに比較して優れた画像を得ることができる。

【図面の簡単な説明】

【図1】この発明の転写ベルトを採用した画像形成装置の一例を示す概略構成図である。

【図2】この発明の実施例を示す転写ベルトの断面図である。

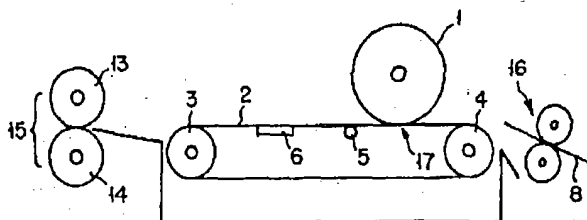
【図3】転写ベルト装置の転写部を示す拡大図である。

【図4】従来の転写ベルトの2層構造を示す断面図である。

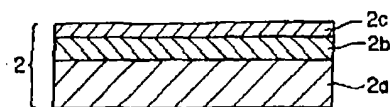
【符号の説明】

- |    |       |
|----|-------|
| 1  | 像担持体  |
| 2  | 転写ベルト |
| 2a | 内層    |
| 2b | 誘電層   |
| 2c | 表層    |
| 8  | 用紙    |

【図1】



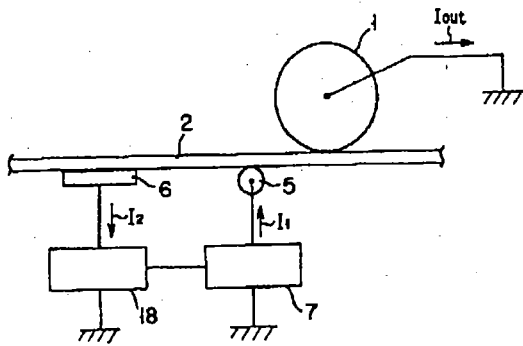
【図2】



(4)

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【図3】



【図4】

